



深圳市拓普微科技开发有限公司

SHENZHEN TOPWAY TECHNOLOGY CO., LTD.

# HMT035ATA-1C

## LCD Module User Manual

|                                                       |                                  |                                   |
|-------------------------------------------------------|----------------------------------|-----------------------------------|
| Prepared by:<br><br><b>LU</b><br><br>Date: 2018-03-21 | Checked by:<br><br><br><br>Date: | Approved by:<br><br><br><br>Date: |
|-------------------------------------------------------|----------------------------------|-----------------------------------|

| Rev. | Descriptions                | Release Date |
|------|-----------------------------|--------------|
| 0.1  | - Preliminary Draft release | 2018-03-21   |
|      |                             |              |
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## 1 Basic Specification

TOPWAY HMT035ATA-1C is a Smart TFT Module with 32bit MCU on board. Its graphics engine provides numbers of outstanding features. It supports TOPWAY TML 3.0 for preload and pre-design display interface that simplify the host operation and development time. Suitable for industry control, instrumentation, medical electronics, power electric equipment applications.

### 1.1 General Specification

|                         |                                                                    |
|-------------------------|--------------------------------------------------------------------|
| Screen Size(Diagonal) : | 3.5"                                                               |
| Resolution :            | 320(RGB) x 240                                                     |
| Color Depth :           | 65k color (16bit)                                                  |
| Pixel Configuration :   | RGB Stripe                                                         |
| Display Mode :          | Transmissive / Normal White                                        |
| Viewing Direction :     | 6H (*1) (gray-scale inverse)<br>12H (*2)                           |
| Outline Dimension :     | 93.0 x 70.1 x 13.8 (max)(mm)<br>(see attached drawing for details) |
| Active Area :           | 70.08 x 52.56 (mm)                                                 |
| Backlight :             | LED                                                                |
| Surface Treatment :     | Glare Treatment (Anti-UV)                                          |
| Command I/F:            | RS-232C                                                            |
| Project Download:       | by PC or by U-Drive (with OTG cable)                               |
| Operating Temperature : | -20 ~ +70°C                                                        |
| Storage Temperature :   | -30 ~ +80°C                                                        |

Note:

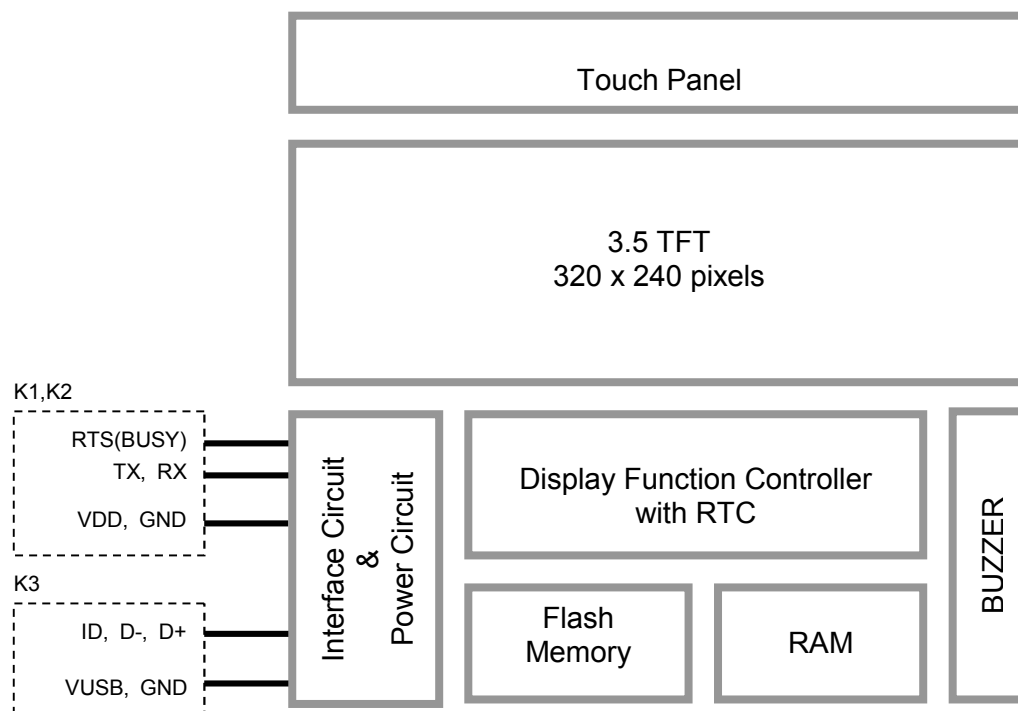
\*1. For saturated color display content (eg. pure-red, pure-green, pure-blue, or pure-colors-combinations).

\*2. For "color scales" display content.

\*3. Color tone may slightly change by Temperature and Driving Condition.

\*4. When using the U-Drive to download project requires short hop JP3, JP4 and disconnect JP1, JP2.

### 1.2 Block Diagram



### 1.3 Terminal Function

#### RS232 Interface Terminal (K1,K2)

| Pin No. | Pin Name  | I/O | Descriptions                                                                                          |
|---------|-----------|-----|-------------------------------------------------------------------------------------------------------|
| 1,2,3   | VDD       | P   | Power supply (5.0 V)                                                                                  |
| 4       | NC        | --  | No connection, leave open                                                                             |
| 5       | RX        | I   | Data Input (eg. to PC's RS-232C pin3 <9pin D-connector>)                                              |
| 6       | TX        | O   | Data output (eg. to PC's RS-232C pin2 <9pin D-connector>)                                             |
| 7       | RTS(BUSY) | O   | Request To Send (could function as busy BUSY signal)<br>(eg. to PC's RS-232C pin2 <9pin D-connector>) |
| 8,9,10  | GND       | P   | Ground, (0V)                                                                                          |

Note.

- \*1. User data and commands transfer through this terminal.
- \*2. HOST using command hand shake during communication is suggested.

#### USB Interface Terminal (K3)

| Pin No. | Pin Name | I/O | Descriptions             |
|---------|----------|-----|--------------------------|
| 1       | VUSB     | P   | Power supply             |
| 2       | D-       | I/O | USB DATA negative signal |
| 3       | D+       | I/O | USB DATA positive signal |
| 4       | ID       | I   | USB_ID, 1:Client, 0:HOST |
| 5       | GND      | P   | Ground, (0V)             |

Note.

- \*1. TML files and image files preload through this terminal
- \*2. Standard "USB-drive" functions provided
- \*3. During the files transfer, all others display functions will be suspended

## 2 Absolute Maximum Ratings

| Items                 | Symbol   | Min. | Max. | Unit | Condition       |
|-----------------------|----------|------|------|------|-----------------|
| Power Supply voltage  | $V_{dd}$ | -0.3 | 5.5  | V    |                 |
| Operating Temperature | $T_{OP}$ | -20  | 70   | °C   | No Condensation |
| Storage Temperature   | $T_{ST}$ | -30  | 80   | °C   | No Condensation |

Note:

- \*1. This rating applies to all parts of the module and should not be exceeded.
- \*2. The operating temperature only guarantees operation of the circuit. The contrast, response speed, and the other specification related to electro-optical display quality is determined at the room temperature,  $T_{OP}=25^{\circ}\text{C}$
- \*3. Ambient temperature when the backlight is lit (reference value)
- \*4. Any Stresses exceeding the Absolute Maximum Ratings may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

### 3 Electrical Characteristics

#### 3.1 DC Characteristics

GND=0V, T<sub>OP</sub> =25°C

| Items                   | Symbol            | MIN. | TYP. | MAX.  | Unit | Applicable Pin/FUNC |
|-------------------------|-------------------|------|------|-------|------|---------------------|
| Operating Voltage       | V <sub>dd</sub>   | 4.8  | 5.0  | 5.2   | V    | VDD                 |
| RxD Input MARK(1)       | V <sub>RxDM</sub> | -3.0 | -    | -15.0 | V    | Rx                  |
| RxD Input SPACE(0)      | V <sub>RXDS</sub> | +3.0 | -    | +15.0 | V    | Rx                  |
| TxD Output MARK(1)      | V <sub>TXDM</sub> | -3.0 | -    | -15.0 | V    | Tx                  |
| TxD Output SPACE(0)     | V <sub>TXDS</sub> | +3.0 | -    | +15.0 | V    | Tx                  |
| Operating Current       | I <sub>DD</sub>   | -    | 300  | 600   | mA   | VDD (*1)            |
| Operating Current (USB) | I <sub>VUSB</sub> | -    | 210  | 420   | mA   | VUSB                |
| Battery Supply Current  | I <sub>BAT</sub>  | -    | 0.6  | -     | uA   |                     |

Note.

\*1. Normal display condition

#### 3.2 AC Characteristics

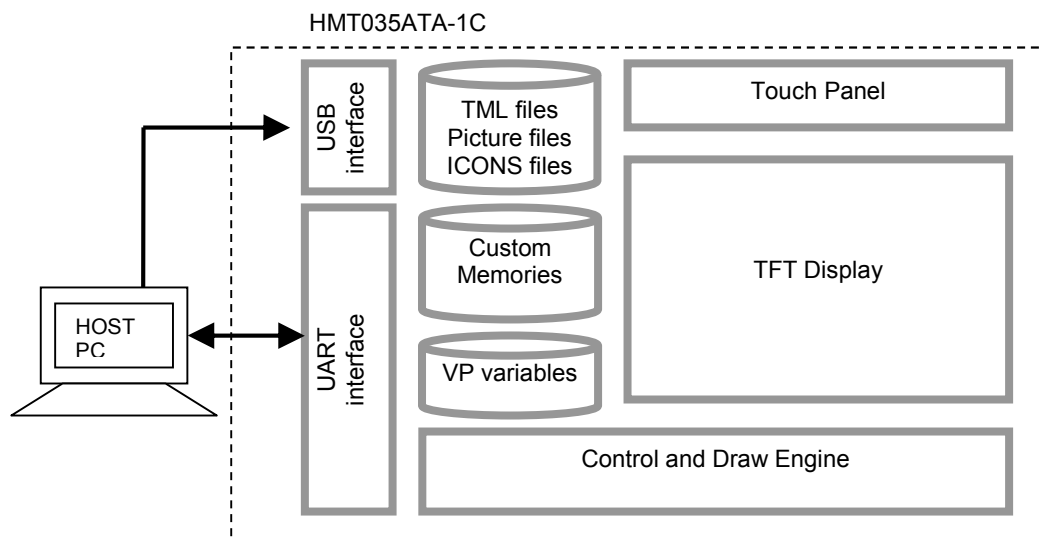
| Items                    | Value     |
|--------------------------|-----------|
| Start bit                | 1         |
| Data bit                 | 8         |
| Parity bit               | None      |
| Stop bit                 | 1         |
| Baud Rate(*1)            | 115200    |
| Serial Data Flow Control | RTS(Busy) |

Note.

\*1.Baud Rate (1200bps~115200bps) could be adjusted by software config.

## 4 Function Specifications

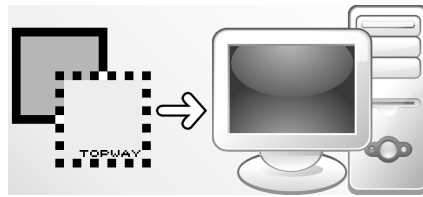
### 4.1 Basic Operation Function Descriptions



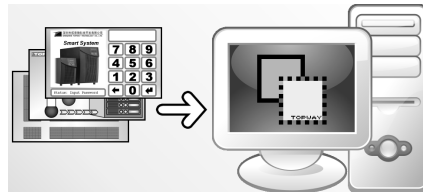
- TML files, Picture files, ICON files are stored inside FLASH memory area. They are preloaded to HMT035ATA-1C for stand alone interface use.
- Those files are preloaded via USB interface as an USB drive.
- All the interface flow and the touch response are based on the preloaded TML files
- VP variables memory is inside RAM area, it provides real time access via UART by the HOST or display onto the TFT by TML file.
- Custom Memories are inside FLASH memory area. It can be accessed via UART interface by the HOST.
- Control and Draw Engine executes HOST commands and response respectively
- It also reports the real time Touch Key number to the HOST

## 4.2 Quick Start Guide

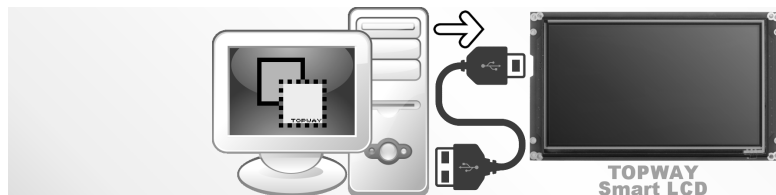
1. Install TOPWAY Graphics Editor



2. Import pictures design UI flow



3. Download to Smart LCD



4. power on & display



5. Connect to host Show real time data



## 4.3 Command Descriptions

Please refer to "SMART LCD Command Manual "

## 5 Optical Characteristics

| Item                    | Symbol                                               |   | Condition                              | Min.           | Typ. | Max. | Unit              | Note |
|-------------------------|------------------------------------------------------|---|----------------------------------------|----------------|------|------|-------------------|------|
| Brightness              | Bp                                                   |   | $\theta=0^{\circ}$<br>$\Phi=0^{\circ}$ | -              | 200  | -    | Cd/m <sup>2</sup> | 1    |
| Uniformity              | $\triangle$ Bp                                       |   |                                        | 80%            | -    | -    |                   | 1,2  |
| Viewing Angle           | $\theta_1$<br>( $\Phi=90^{\circ}$ or $270^{\circ}$ ) |   | Cr $\geq$ 10                           | -25 $\sim$ +60 |      |      | Deg               | 3    |
|                         | $\theta_2$<br>( $\Phi=0^{\circ}$ or $180^{\circ}$ )  |   |                                        | -45 $\sim$ +45 |      |      |                   |      |
| Contrast Ratio          | Cr                                                   |   | $\theta=0^{\circ}$<br>$\Phi=0^{\circ}$ | -              | 300  | -    | -                 | 4    |
| Response Time           | T <sub>r</sub>                                       |   |                                        | -              | 25   | 40   | ms                | 5    |
|                         | T <sub>f</sub>                                       |   |                                        | -              | 25   | 40   | ms                |      |
| Color of CIE Coordinate | W                                                    | x | $\theta=0^{\circ}$<br>$\Phi=0^{\circ}$ | -              | 0.29 | -    | -                 | 1,6  |
|                         |                                                      | y |                                        | -              | 0.31 | -    | -                 |      |
|                         | R                                                    | x |                                        | -              | 0.60 | -    | -                 |      |
|                         |                                                      | y |                                        | -              | 0.37 | -    | -                 |      |
|                         | G                                                    | x |                                        | -              | 0.34 | -    | -                 |      |
|                         |                                                      | y |                                        | -              | 0.57 | -    | -                 |      |
|                         | B                                                    | x |                                        | -              | 0.15 | -    | -                 |      |
|                         |                                                      | y |                                        | -              | 0.09 | -    | -                 |      |
| NTSC Ratio              | S                                                    |   |                                        | 50             | -    |      | %                 |      |

Note: The parameter is slightly changed by temperature, driving voltage and materiel.



The data are measured after LEDs are turned on for 5 minutes. LCM displays full white. The brightness is the average value of 9 measured spots. Measurement equipment PR-705 (Φ8mm)

Measuring condition:

- Measuring surroundings: Dark room
- Measuring temperature:  $T_a=25^{\circ}\text{C}$ .
- Adjust operating voltage to get optimum contrast at the center of the display.

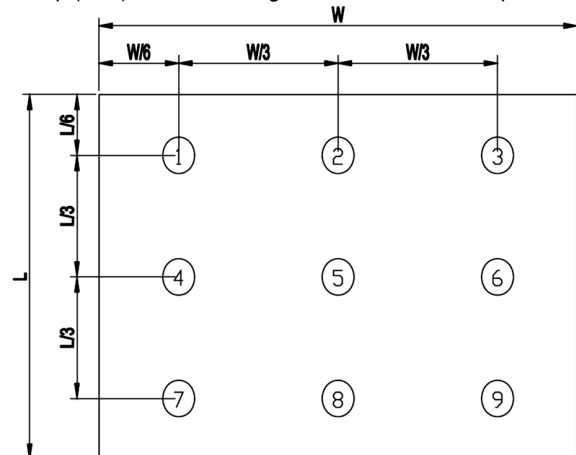
Measured value at the center point of LCD panel after more than 5 minutes while backlight turning on.

The luminance uniformity is calculated by using following formula.

$$\Delta Bp = Bp (\text{Min.}) / Bp (\text{Max.}) \times 100 (\%)$$

$Bp (\text{Max.})$  = Maximum brightness in 9 measured spots

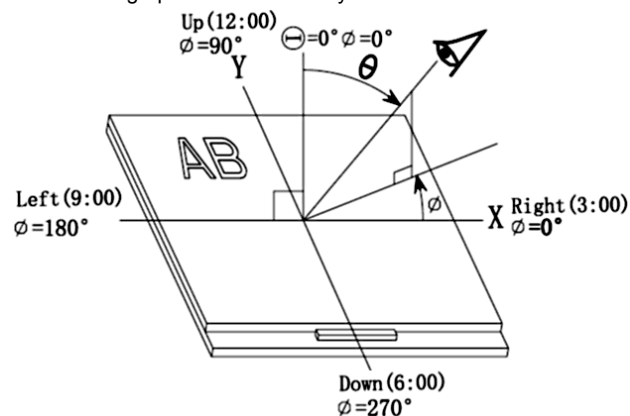
$Bp (\text{Min.})$  = Minimum brightness in 9 measured spots.



Note 3:

The definition of viewing angle:

Refer to the graph below marked by  $\theta$  and  $\phi$



Note 4:

The definition of contrast ratio (Test LCM using PR-705):

$$\text{Contrast Ratio (CR)} = \frac{\text{Luminance When LCD is at "White" state}}{\text{Luminance When LCD is at "Black" state}}$$

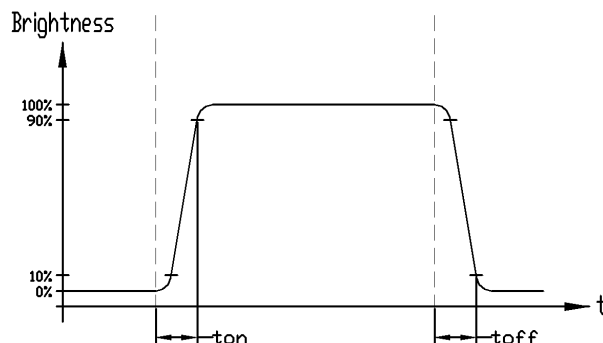
(Contrast Ratio is measured in optimum common electrode voltage)

Note 5:

Definition of Response time. (Test LCD using DMS501):

The output signals of photo detector are measured when the input signals are changed from "black" to "white" (falling time) and from "white" to "black" (rising time), respectively.

The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below.

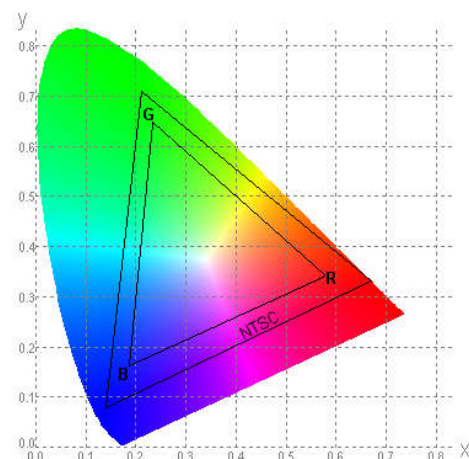


Note 6:

Definition of Color of CIE Coordinate and NTSC Ratio.

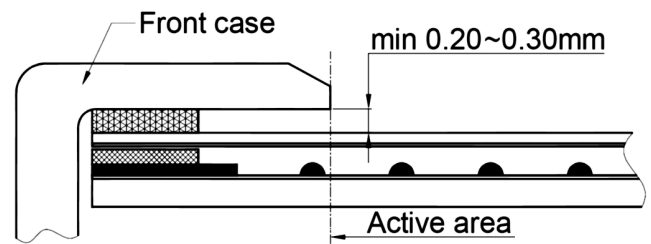
Color gamut:

$$S = \frac{\text{Area of RGB triangle}}{\text{Area of NTSC triangle}} \times 100\%$$

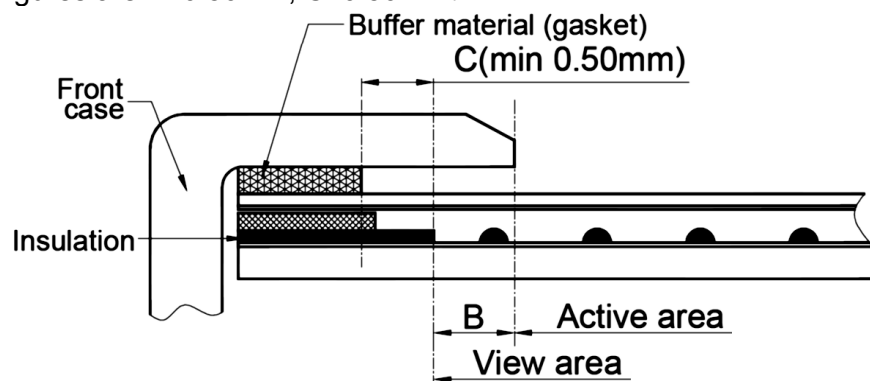


## 6 Touch panel Design Precautions

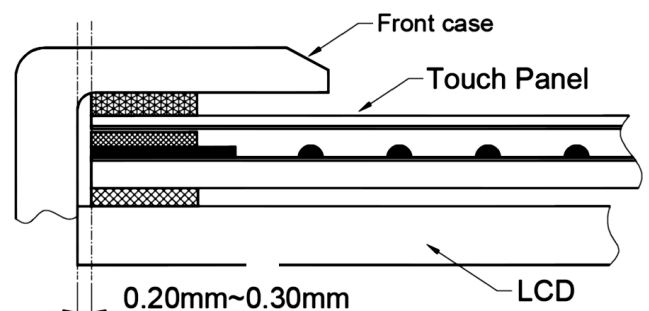
1. It should prevent front case touching the touch panel Active Area (A.A.) to prevent abnormal touch. It should left gab (e.g. 0.2~0.3mm) in between.



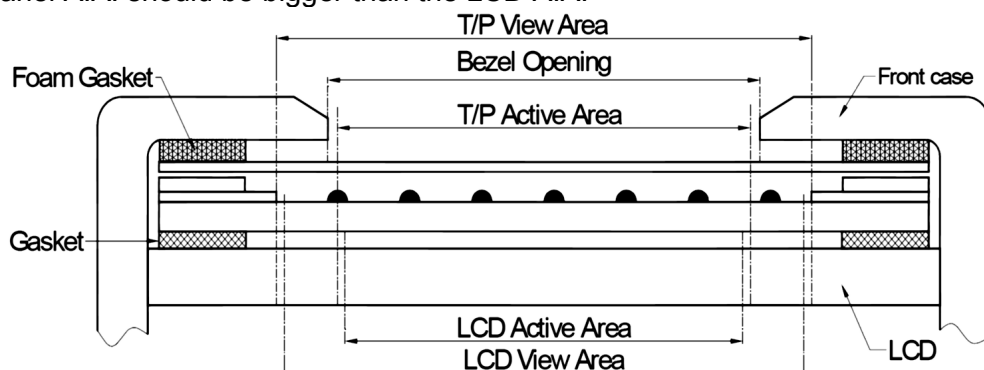
2. Outer case design should take care about the area outside the A.A. Those areas contain circuit wires which is having different thickness. Touching those areas could deform the ITO film. As a result case the ITO cold be damaged and shorten its lifetime. It is suggested to protect those areas with gasket (between the front case and the touch panel). The suggested figures are  $B \geq 0.50\text{mm}$ ;  $C \geq 0.50\text{mm}$ .



3. The front case side wall should keep space (e.g. 0.2 ~ 0.3mm) from the touch panel.



4. In general design, touch panel V.A. should be bigger than the LCD V.A. and touch panel A.A. should be bigger than the LCD A.A.



## 7 Precautions of using LCD Modules

### Mounting

- Mounting must use holes arranged in four corners or four sides.
- The mounting structure so provide even force on to LCD module. Uneven force (ex. Twisted stress) should not applied to the module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
- It is suggested to attach a transparent protective plate to the surface in order to protect the polarizer. It should have sufficient strength in order to the resist external force.
- The housing should adopt radiation structure to satisfy the temperature specification.
- Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
- Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. Never rub with dust clothes with chemical treatment. Do not touch the surface of polarizer for bare hand or greasy cloth.(Some cosmetics deteriorate the polarizer.)
- When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.
- Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer

### Operating

- The spike noise causes the mis-operation of circuits. It should be within the  $\pm 200\text{mV}$  level (Over and under shoot voltage)
- Response time depends on the temperature.(In lower temperature, it becomes longer.)
- Brightness depends on the temperature. (In lower temperature, it becomes lower.) And in lower temperature, response time(required time that brightness is stable after turned on) becomes longer.
- Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
- When fixed patterns are displayed for a long time, remnant image is likely to occur.
- Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimized the interference

### Electrostatic Discharge Control

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc. And don't touch interface pin directly.

### Strong Light Exposure

Strong light exposure causes degradation of polarizer and color filter.

### Storage

When storing modules as spares for a long time, the following precautions are necessary.

- Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between  $5^{\circ}\text{C}$  and  $35^{\circ}\text{C}$  at normal humidity.
- The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.

### Protection Film

- When the protection film is peeled off, static electricity is generated between the film and polarizer. This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.
- The protection film is attached to the polarizer with a small amount of glue. If some stress is applied to rub the protection film against the polarizer during the time you peel off the film, the glue is apt to remain on the polarizer. Please carefully peel off the protection film without rubbing it against the polarizer.
- When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the polarizer after the protection film is peeled off.
- You can remove the glue easily. When the glue remains on the polarizer surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.

### Transportation

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.



深圳市拓普微科技开发有限公司  
SHENZHEN TOPWAY TECHNOLOGY CO., LTD.

# SMART LCD

## Command V5.04

### Manual

|                                                        |                                  |                                   |
|--------------------------------------------------------|----------------------------------|-----------------------------------|
| Prepared by:<br><br><b>liu</b><br><br>Date: 2017-07-24 | Checked by:<br><br><br><br>Date: | Approved by:<br><br><br><br>Date: |
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| Rev. | Descriptions                              | Release Date |
|------|-------------------------------------------|--------------|
| 0.1  | - Preliminary Draft release               | 2016-11-02   |
| 0.2  | - Add a description of the 0xE8 command   | 2017-01-12   |
| 0.3  | - 4.1, 0xE2, 0xE3 command name correction | 2017-05-26   |
| 0.4  | - Add a description of the 0xE7 command   | 2017-07-24   |
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## 1 Basic Specifications

TOPWAY Smart LCD serial command is for real-time control and access. Host machine get the data which input through the Smart LCD interface or provide the data for display.

### 1.1 Hardware connection

Smart LCD serial UART interface are mainly base on RS232-C standard, by default, config as 8N1 115200bps.

## 2 Command Structure

### 2.1 Communication Packet Structure

Commands and Response Packet should be format as follow (host→module):

| Seq    | Code     | Code type         | Description |
|--------|----------|-------------------|-------------|
| 1      | 0xAA     | Packet header     | 1byte       |
| 2      | Cmd-code | Command code      | 1byte       |
| 3      | Par-data | Parameter or Data | (*1)        |
| :      | :        | -                 | -           |
| :      | :        | -                 | -           |
| :      | :        | -                 | -           |
| N-3 th | 0xCC     | Packet tail       | 4byte       |
| N-2 th | 0x33     |                   |             |
| N-1 th | 0xC3     |                   |             |
| N th   | 0x3C     |                   |             |

Note.

\*1. Unless otherwise specified, all the multi-byte values, data, address' byte sequence are MSB first, LSB last.

### 2.2 Packet Acknowledgment

Packet Acknowledgment is two byte in ASCII (module → host):

| Response                                               | code | Description           |
|--------------------------------------------------------|------|-----------------------|
| Command (in packet) executed and wait for next Command | ">"  | In ASCII (0x3a, 0x3e) |
| Command (in packet) error and wait for next Command    | "!>" | In ASCII (0x21, 0x3e) |

Note.

\*1. Packet Acknowledgement response to a valid packet only.

### 3 Data arrangement

#### 3.1 Color Data Value Configuration

16 bit Color value

| 16 bit color value |    |    |    |    |    |    |    |                |    |    |    |    |    |    |    |
|--------------------|----|----|----|----|----|----|----|----------------|----|----|----|----|----|----|----|
| R4                 | R3 | R2 | R1 | R0 | G5 | G4 | G3 | G2             | G1 | G0 | B4 | B3 | B2 | B1 | B0 |
| High byte (MSB)    |    |    |    |    |    |    |    | Low byte (LSB) |    |    |    |    |    |    |    |
| D7                 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | D7             | D6 | D5 | D4 | D3 | D2 | D1 | D0 |

#### 3.2 Data / Address / Page\_ID / Location Values Configuration

64bit value

| 64 bit number value |           |           |           |             |           |          |         |
|---------------------|-----------|-----------|-----------|-------------|-----------|----------|---------|
| D63...D56           | D55...D48 | D47...D40 | D39...D32 | D31...D24   | D23...D16 | D15...D8 | D7...D0 |
| Byte7 (MSB)         |           |           |           | Byte0 (LSB) |           |          |         |
| D7...D0             | D7...D0   | D7...D0   | D7...D0   | D7...D0     | D7...D0   | D7...D0  | D7...D0 |

32bit value

| 32 bit number value |           |             |         |
|---------------------|-----------|-------------|---------|
| D31...D24           | D23...D16 | D15...D8    | D7...D0 |
| Byte3 (MSB)         |           | Byte0 (LSB) |         |
| D7...D0             | D7...D0   | D7...D0     | D7...D0 |

16bit value

| 16 bit number value |                |
|---------------------|----------------|
| D15...D8            | D7...D0        |
| High Byte (MSB)     | Low Byte (LSB) |
| D7...D0             | D7...D0        |

## 4 Command Descriptions

### 4.1 Command table

| Functions                       | Name                  | Code                             | Description                                                                                                             |
|---------------------------------|-----------------------|----------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Config/<br>Status<br>Functions  | hand_shake            | 0x30                             | Read a Hand Shake                                                                                                       |
|                                 | read_version          | 0x31                             | Read firmware version                                                                                                   |
|                                 | read_pg_id            | 0x32                             | Read Current page ID                                                                                                    |
|                                 | touch_response        | 0x72/0x73/<br>0x77/0x78/<br>0x79 | see also set_sys_config                                                                                                 |
|                                 | set_sys_config        | 0xE0                             | System parameter configuration and Baud Rate                                                                            |
|                                 | sel_project           | 0xE1                             | Specify operating project folder                                                                                        |
|                                 | touch_calib           | 0xE4                             | Touch panel calibration                                                                                                 |
|                                 | screen_saver          | 0x5E                             | Screen saver (backlight dim down time out)                                                                              |
|                                 | backlight_ctrl        | 0x5F                             | backlight brightness control (64 levels)                                                                                |
|                                 | buzzer_touch_sound    | 0x79                             | buzzer enable time length (in 10ms step)                                                                                |
|                                 | buzzer_ctrl           | 0x7A                             | Buzzer control                                                                                                          |
|                                 | Flash_write           | 0x90                             | Write data to the flash                                                                                                 |
|                                 | Flash_read            | 0x91                             | Read data from the flash                                                                                                |
|                                 | RTC_read              | 0x9B                             | Read the RTC values                                                                                                     |
|                                 | RTC_set               | 0x9C                             | Set the RTC                                                                                                             |
|                                 | USR_bin_read          | 0x93                             | Read data from the USR_bin                                                                                              |
|                                 | U_drv_format          | 0xE2                             | Format the U_drv                                                                                                        |
|                                 | U_drv_unlock          | 0xE3                             | Unlock the U_drv with pre-stored password                                                                               |
| Display<br>Control<br>Functions | disp_page             | 0x70                             | Display a pre-stored TML file (page)                                                                                    |
|                                 | set_element_fg        | 0x7E                             | Set the foreground color of STR, N16, N32 or N64                                                                        |
|                                 | set_element_bg        | 0x7F                             | Set the background color of STR, N16, N32 or N64                                                                        |
|                                 | set_codepage          | 0xE7                             | Sets country character set and code-page character set                                                                  |
|                                 | suspend_vp_fresh      | 0xE8                             | Set the screen to pause the refresh and deactivate the touchkey or release the pause to refresh and enable the touchkey |
| VP<br>Functions                 | Successive_write      | 0x82                             | Write successive value to VP_N16, VP_N32, VP_N64                                                                        |
|                                 | Successive_read       | 0x83                             | Read successive value from VP_N16, VP_N32, VP_N64                                                                       |
|                                 | BP1_write             | 0x4B                             | Write bit-map (1bpp) data to VP_BP1                                                                                     |
|                                 | BP1_write_comp        | 0x4C                             | Write compressed bit-map (1bpp) data to VP_BP1                                                                          |
|                                 | G16_write             | 0x4D                             | Write 16bit (signed integer) graphic array to VP_G16                                                                    |
|                                 | G16_write_rotate      | 0x4E                             | Rotate the VP_G16 array data inside the module and write a 16bit (signed integer) value into end-of-array               |
|                                 | System Register Write | 0x3B                             | Write System Register                                                                                                   |
|                                 | System Register Read  | 0x3C                             | Read System Register                                                                                                    |
|                                 | STR_write             | 0x42                             | Write string to VP_STR                                                                                                  |
|                                 | STR_read              | 0x43                             | Read string form VP_STR                                                                                                 |
|                                 | STR_fill              | 0x46                             | Fill strings to the VP_STR                                                                                              |
|                                 | N16_write             | 0x3d                             | Write 16bit (signed integer) value to VP_N16                                                                            |
|                                 | N16_read              | 0x3e                             | Read 16bit (signed integer) value from VP_N16                                                                           |
|                                 | N16_fill              | 0x3f                             | Fill numbers to the VP_N16                                                                                              |
|                                 | N32_write             | 0x44                             | Write 32bit (signed integer) value to VP_N32                                                                            |
|                                 | N32_read              | 0x45                             | Read 32bit (signed integer) value from VP_N32                                                                           |
|                                 | N32_fill              | 0x47                             | Fill numbers to the VP_N32                                                                                              |
|                                 | N64_write             | 0x48                             | Write 64bit (signed integer) value to VP_N64                                                                            |
|                                 | N64_read              | 0x49                             | Read 64bit (signed integer) value from VP_N64                                                                           |
|                                 | N64_fill              | 0x4A                             | Fill numbers to the VP_N64                                                                                              |



## 4.2 Config/ Status Function Commands Details

### 4.2.1 hand\_shake ( 0x30 )

| seq | Cmd-code / Par-data | Descriptions      |
|-----|---------------------|-------------------|
| 1   | 0x30                | Read a Hand Shake |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

#### Response code:

| Seq.             | Content | Byte in Hex | Descriptions                  |
|------------------|---------|-------------|-------------------------------|
| 1 <sup>st</sup>  | Header  | 0xAA        | Communication packet header   |
| 2 <sup>nd</sup>  | Command | 0x30        | Command executed              |
| 3 <sup>rd</sup>  | "T"     | 0x54        | "Topway HMT Ready\0" in ASCII |
| 4 <sup>th</sup>  | "o"     | 0x6f        |                               |
| 5 <sup>th</sup>  | "P"     | 0x70        |                               |
| 6 <sup>th</sup>  | "w"     | 0x77        |                               |
| 7 <sup>th</sup>  | "a"     | 0x61        |                               |
| 8 <sup>th</sup>  | "y"     | 0x79        |                               |
| 9 <sup>th</sup>  | " "     | 0x20        |                               |
| 10 <sup>th</sup> | "H"     | 0x48        |                               |
| 11 <sup>th</sup> | "M"     | 0x4d        |                               |
| 12 <sup>th</sup> | "T"     | 0x54        |                               |
| 13 <sup>th</sup> | " "     | 0x20        |                               |
| 14 <sup>th</sup> | "R"     | 0x52        |                               |
| 15 <sup>th</sup> | "e"     | 0x65        |                               |
| 16 <sup>th</sup> | "a"     | 0x61        |                               |
| 17 <sup>th</sup> | "d"     | 0x64        |                               |
| 18 <sup>th</sup> | "y"     | 0x79        |                               |
| 19 <sup>th</sup> | \0      | 0x00        | '\0'(0x00): string end mark   |
| 20 <sup>th</sup> | Tail    | 0xCC        | Communication packet tail     |
| 21 <sup>st</sup> |         | 0x33        |                               |
| 22 <sup>nd</sup> |         | 0xC3        |                               |
| 23 <sup>rd</sup> |         | 0x3C        |                               |

Note.

\*1. The Response code with communication packet format (see Communication Packet Structure Section for details)

### 4.2.2 read\_version ( 0x31 )

| Seq | Cmd-code / Par-data | Descriptions          |
|-----|---------------------|-----------------------|
| 1   | 0x31                | Read firmware version |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

#### Response code:

| Seq.             | Content | Byte in Hex | Descriptions                                                  |
|------------------|---------|-------------|---------------------------------------------------------------|
| 1 <sup>st</sup>  | Header  | 0xAA        | Communication packet header                                   |
| 2 <sup>nd</sup>  | Command | 0x31        | Command executed                                              |
| 3 <sup>rd</sup>  | "1"     | 0x31        | "1.06\0" in ASCII<br>Where firmware version is V1.06(example) |
| 4 <sup>th</sup>  | "."     | 0x2e        |                                                               |
| 5 <sup>th</sup>  | "0"     | 0x30        |                                                               |
| 6 <sup>th</sup>  | "6"     | 0x36        |                                                               |
| 7 <sup>th</sup>  | \0      | 0x00        | '\0'(0x00): string end mark                                   |
| 8 <sup>th</sup>  | Tail    | 0xCC        | Communication packet tail                                     |
| 9 <sup>th</sup>  |         | 0x33        |                                                               |
| 10 <sup>th</sup> |         | 0xC3        |                                                               |
| 11 <sup>th</sup> |         | 0x3C        |                                                               |

Note.

\*1. The Response code with communication packet format (see Communication Packet Structure Section for details)

### 4.2.3 read\_pg\_id ( 0x32 )

| Seq | Cmd-code / Par-data | Descriptions         |
|-----|---------------------|----------------------|
| 1   | 0x32                | Read Current page ID |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

#### Response code:

| Seq.            | Content | Byte in Hex | Descriptions                          |
|-----------------|---------|-------------|---------------------------------------|
| 1 <sup>st</sup> | Header  | 0xAA        | Communication packet header           |
| 2 <sup>nd</sup> | Command | 0x32        | Command executed                      |
| 3 <sup>rd</sup> | Page ID | Page_IDh    | Current Page ID in 16bit binary value |
| 4 <sup>th</sup> |         | Page_IDl    |                                       |
| 5 <sup>th</sup> | Tail    | 0xCC        | Communication packet tail             |
| 6 <sup>th</sup> |         | 0x33        |                                       |
| 7 <sup>th</sup> |         | 0xC3        |                                       |
| 8 <sup>th</sup> |         | 0x3C        |                                       |

Note.

\*1. The Response code with communication packet format (see Communication Packet Structure Section for details)

### 4.2.4 touch\_response ( 0x72/ 0x73/ 0x77/ 0x78/ 0x79 )

| seq | Cmd-code / Par-data | Descriptions                               |
|-----|---------------------|--------------------------------------------|
| 1   | --                  | Use set_sys_config to config the functions |

#### Touch Release Coordinate Response code (0x72):

| Seq.             | Content      | Byte in Hex | Descriptions                                                                             |
|------------------|--------------|-------------|------------------------------------------------------------------------------------------|
| 1 <sup>st</sup>  | Header       | 0xAA        | Communication packet header                                                              |
| 2 <sup>nd</sup>  | Command      | 0x72        | Touched release Coordinate                                                               |
| 3 <sup>rd</sup>  | X coordinate | Xh          | Coordinate in 16bit binary value<br>X = horizontal coordinate<br>Y = vertical coordinate |
| 4 <sup>th</sup>  |              | Xl          |                                                                                          |
| 5 <sup>th</sup>  | Y coordinate | Yh          |                                                                                          |
| 6 <sup>th</sup>  |              | Yl          |                                                                                          |
| 7 <sup>th</sup>  | Tail         | 0xCC        | Communication packet tail                                                                |
| 8 <sup>th</sup>  |              | 0x33        |                                                                                          |
| 9 <sup>th</sup>  |              | 0xC3        |                                                                                          |
| 10 <sup>th</sup> |              | 0x3C        |                                                                                          |

Note.

\*1. The Response code with communication packet format (see Communication Packet Structure Section for details)

#### Touch Down Coordinate Response code ( 0x73 ):

| Seq.             | Content      | Byte in Hex | Descriptions                                                                             |
|------------------|--------------|-------------|------------------------------------------------------------------------------------------|
| 1 <sup>st</sup>  | Header       | 0xAA        | Communication packet header                                                              |
| 2 <sup>nd</sup>  | Command      | 0x73        | Touched down Coordinate                                                                  |
| 3 <sup>rd</sup>  | X coordinate | Xh          | Coordinate in 16bit binary value<br>X = horizontal coordinate<br>Y = vertical coordinate |
| 4 <sup>th</sup>  |              | Xl          |                                                                                          |
| 5 <sup>th</sup>  | Y coordinate | Yh          |                                                                                          |
| 6 <sup>th</sup>  |              | Yl          |                                                                                          |
| 7 <sup>th</sup>  | Tail         | 0xCC        | Communication packet tail                                                                |
| 8 <sup>th</sup>  |              | 0x33        |                                                                                          |
| 9 <sup>th</sup>  |              | 0xC3        |                                                                                          |
| 10 <sup>th</sup> |              | 0x3C        |                                                                                          |

Note.

\*1. The Response code with communication packet format (see Communication Packet Structure Section for details)

#### Touch Key ID Response code ( 0x78 ):

| Seq.            | Content      | Byte in Hex | Descriptions                                                                         |
|-----------------|--------------|-------------|--------------------------------------------------------------------------------------|
| 1 <sup>st</sup> | Header       | 0xAA        | Communication packet header                                                          |
| 2 <sup>nd</sup> | Command      | 0x78        | Touched release Key_ID defined by TOPWAY TML Graphic Editor will be response to host |
| 3 <sup>rd</sup> | Page_ID      | Page_IDh    | Page_ID = the touch key in page(16bit binary value)                                  |
| 4 <sup>th</sup> |              | Page_IDl    |                                                                                      |
| 5 <sup>th</sup> | Y coordinate | Key_ID      | Key_ID (8bit binary value)                                                           |
| 6 <sup>th</sup> | Tail         | 0xCC        | Communication packet tail                                                            |
| 7 <sup>th</sup> |              | 0x33        |                                                                                      |
| 8 <sup>th</sup> |              | 0xC3        |                                                                                      |
| 9 <sup>th</sup> |              | 0x3C        |                                                                                      |

Note.

\*1. The Response code with communication packet format (see Communication Packet Structure Section for details)

**Touch Key ID Response code ( 0x79 ):**

| Seq.            | Content      | Byte in Hex | Descriptions                                                                      |
|-----------------|--------------|-------------|-----------------------------------------------------------------------------------|
| 1 <sup>st</sup> | Header       | 0xAA        | Communication packet header                                                       |
| 2 <sup>nd</sup> | Command      | 0x79        | Touched down Key_ID defined by TOPWAY TML Graphic Editor will be response to host |
| 3 <sup>rd</sup> | Page_ID      | Page_IDh    | Page_ID = the touch key in page(16bit binary value)                               |
| 4 <sup>th</sup> |              | Page_IDl    |                                                                                   |
| 5 <sup>th</sup> | Y coordinate | Key_ID      | Key_ID (8bit binary value)                                                        |
| 6 <sup>th</sup> | Tail         | 0xCC        | Communication packet tail                                                         |
| 7 <sup>th</sup> |              | 0x33        |                                                                                   |
| 8 <sup>th</sup> |              | 0xC3        |                                                                                   |
| 9 <sup>th</sup> |              | 0x3C        |                                                                                   |

Note.

\*1. The Response code with communication packet format (see Communication Packet Structure Section for details)

**Touch Key VP\_ADD+VP\_Value Response code ( 0x77 ):**

| Seq.            | Content | Byte in Hex | Descriptions                                                             |
|-----------------|---------|-------------|--------------------------------------------------------------------------|
| 1 <sup>st</sup> | Header  | 0xAA        | Communication packet header                                              |
| 2 <sup>nd</sup> | Command | 0x77        | Touch Key VP_ADD+VP_Value Response code                                  |
| 3 <sup>rd</sup> | VP_ADD  | Addr3 (MSB) | VP Address                                                               |
| 4 <sup>th</sup> |         | Addr2       | 0x080000 ~ 0x08FFFF:VP_N16 Address                                       |
| 5 <sup>th</sup> |         | Addr1       | 0x020000 ~ 0x02FFFF:VP_N32 Address                                       |
| 6 <sup>th</sup> |         | Addr0(LSB)  | 0x030000 ~ 0x03FFFF:VP_N64 Address<br>0x000000 ~ 0x01FFFF:VP_STR Address |
| 7 <sup>th</sup> | Data    | :           | No.of byte                                                               |
| :               |         | :           | VP_N16: 2byte                                                            |
| :               |         | :           | VP_N32: 4byte                                                            |
| :               |         | :           | VP_N64: 8byte                                                            |
| :               | Tail    | :           | VP_STR: string (with end mark ("'\0'(0x00)))                             |
| :               |         | 0xCC        | Communication packet tail                                                |
| :               |         | 0x33        |                                                                          |
| :               |         | 0xC3        |                                                                          |
| :               |         | 0x3C        |                                                                          |

Note.

\*1. The Response code with communication packet format (see Communication Packet Structure Section for details)

**4.2.5 set\_sys\_config ( 0xE0 )**

| seq | Cmd-code / Par-data | Descriptions                                                                                                                                                       |
|-----|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | 0xE0                | Baud Rate and system parameter configuration                                                                                                                       |
| 2   | 0x55                |                                                                                                                                                                    |
| 3   | 0xAA                |                                                                                                                                                                    |
| 4   | 0x5A                |                                                                                                                                                                    |
| 5   | 0xA5                |                                                                                                                                                                    |
| 6   | Baud_Set            | Baudrate Set:<br>0x00 = 1200bps<br>0x01 = 2400bps<br>0x02 = 4800bps<br>0x03 = 9600bps<br>0x04 = 19200bps<br>0x05 = 38400bps<br>0x06 = 57600bps<br>0x07 = 115200bps |
| 7   | sys_par1            | Bit7 = 0: Touch panel function disable<br>Bit7 = 1: Touch panel functions enable (*3)(default)<br>Bit[1..0]: Touch actions configuration (*2, *3)                  |
| 8   | 0x00                | Reserved                                                                                                                                                           |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

\*2. Touch panel configuration:

| Sys_par1 Bit7 | Sys_par1 Bit1 | Sys_par1 Bit0 | Response To host | Descriptions                                                               |
|---------------|---------------|---------------|------------------|----------------------------------------------------------------------------|
| 0             | 0             | 0             | Null             | Not touch panel functions                                                  |
| 1             | 0             | 1             | Coordinates      | Touch down Coordinate will be response to host                             |
| 1             | 1             | 0             | Coordinates      | Touch release Coordinate will be response to host                          |
| 1             | 1             | 1             | Key ID           | Touch Key_ID defined by TOPWAY TML Graphic Editor will be response to host |

\*3. see set\_touch section for response code

**4.2.6 sel\_project ( 0xE1 )**

| seq | Cmd-code / Par-data | Descriptions                                                                                                         |
|-----|---------------------|----------------------------------------------------------------------------------------------------------------------|
| 1   | 0xE1                | Select project folder                                                                                                |
| 2   | Prj_ID              | 0~9, project ID<br>0: System execute the default project "THMT"<br>1~9: System execute the project "THMT01"~"THMT09" |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

**4.2.7 touch\_calib ( 0xE4 )**

| seq | Cmd-code / Par-data | Descriptions            |
|-----|---------------------|-------------------------|
| 1   | 0xE4                | Touch panel calibration |
| 2   | 0x55                |                         |
| 3   | 0xAA                |                         |
| 4   | 0x5A                |                         |
| 5   | 0xA5                |                         |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

\*2. Keep pressing the touch panel during power on, could also trigger the touch\_calib function

**4.2.8 screen\_saver (0x5E)**

| seq | Cmd-code / Par-data | Descriptions                                                                                                                                                                        |
|-----|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | 0x5E                | Screen saver                                                                                                                                                                        |
| 2   | Time1h              | time out time in seconds, range: 0x0000 ~ 0xffff<br>(0x0000: disable screen saver function) (*2)                                                                                    |
| 3   | Time1l              |                                                                                                                                                                                     |
| 4   | PWM_LE              | PWM_LE = 0 ~ 0x3F (default 0x19 in dim down),<br>the backlight dimmed level in screen saving mode (*2)<br>Screensavers brightness can not be greater than the backlight brightness. |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

\*2. default value defined by TML graphic editor configuration

**4.2.9 backlight\_ctrl ( 0x5F )**

| seq | Cmd-code / Par-data | Descriptions                 |
|-----|---------------------|------------------------------|
| 1   | 0x5F                | backlight brightness control |
| 2   | PWM_LE              | PWM_LE=0x00 ~ 0x3F (*2)      |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

\*2. default value defined by TML graphic editor configuration

**4.2.10 buzzer\_touch\_sound ( 0x79 )**

| seq | Cmd-code / Par-data | Descriptions                                                          |
|-----|---------------------|-----------------------------------------------------------------------|
| 1   | 0x79                | buzzer touch sound control                                            |
| 2   | Time                | Sounding time length (in 10ms), range 0x00~0x3F<br>0x00= disable (*2) |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

\*2. default value defined by TML graphic editor configuration

**4.2.11 buzzer\_ctrl ( 0x7A )**

| seq | Cmd-code / Par-data | Descriptions                                                                                                         |
|-----|---------------------|----------------------------------------------------------------------------------------------------------------------|
| 1   | 0x7A                | Buzzer control                                                                                                       |
| 2   | Loop count          | Loop count, Range: 0x01 ~ 0xFF.<br>0xFF = buzzer infinite loop                                                       |
| 3   | T1                  | Buzzer play time 1<br>Range: 0x00 ~ 0xFF (0~25.5s)(unit 100ms)                                                       |
| 4   | T2                  | Buzzer play time 2<br>Range: 0x00 ~ 0xFF (0~25.5s)(unit 100ms)                                                       |
| 5   | Freq1               | T1 time Buzzer frequency, Unit 100 Hz<br>Ranges: 0x05 ~ 0x32 (500Hz ~ 5KHz)<br>0x00 = T1 time period buzzer turn off |
| 6   | Freq2               | T2 time Buzzer frequency, Unit 100 Hz<br>Ranges: 0x05 ~ 0x32 (500Hz ~ 5KHz)<br>0x00 = T1 time period buzzer turn off |

Note:

1. The buzzer sound time is (T1 + T2)\*100ms

## 4.2.12 Flash\_write ( 0x90 )

| seq | Cmd-code / Par-data | Descriptions                                                              |
|-----|---------------------|---------------------------------------------------------------------------|
| 1   | 0x90                | Write data to the flash at specified address                              |
| 2   | Address3(MSB)       | the specified start address to write<br>Address range =0x00000 ~ 0x03FFFF |
| 3   | Address2            |                                                                           |
| 4   | Address1            |                                                                           |
| 5   | Address0(LSB)       |                                                                           |
| 6   | Data_Lengthh        | The no. of data byte to write.<br>Length =0x0001 ~ 0x0400                 |
| 7   | Data_Lengthl        |                                                                           |
| 8   | Data                | data to write.                                                            |
| :   | :                   |                                                                           |
| :   | :                   |                                                                           |
| :   | :                   |                                                                           |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

## 4.2.13 Flash\_read ( 0x91 )

| seq | Cmd-code / Par-data | Descriptions                                                              |
|-----|---------------------|---------------------------------------------------------------------------|
| 1   | 0x91                | Read data from the flash at specified address                             |
| 2   | Address3(MSB)       | the specified start address to write<br>Address range =0x00000 ~ 0x03FFFF |
| 3   | Address2            |                                                                           |
| 4   | Address1            |                                                                           |
| 5   | Address0(LSB)       |                                                                           |
| 6   | Data_Lengthh        | The no. of data byte to read<br>Length =0x0001 ~ 0x0400                   |
| 7   | Data_Lengthl        |                                                                           |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

## Response code:

| Seq.            | Content | Byte in Hex | Descriptions                |
|-----------------|---------|-------------|-----------------------------|
| 1 <sup>st</sup> | Header  | 0xAA        | Communication packet header |
| 2 <sup>nd</sup> | Command | 0x91        | Command executed            |
| 3 <sup>rd</sup> | Data    | data        | Read back data              |
| :               |         | :           |                             |
| :               |         | :           |                             |
| :               | Tail    | 0xCC        | Communication packet tail   |
| :               |         | 0x33        |                             |
| :               |         | 0xC3        |                             |
| :               |         | 0x3C        |                             |

Note.

\*1. The Response code with communication packet format (see Communication Packet Structure Section for details)

## 4.2.14 RTC\_read ( 0x9B )

| seq | Cmd-code / Par-data | Descriptions               |
|-----|---------------------|----------------------------|
| 1   | 0x9B                | Read the current RTC value |

## Response code:

| Seq.             | Content | Byte in Hex | Descriptions                                   |
|------------------|---------|-------------|------------------------------------------------|
| 1 <sup>st</sup>  | Header  | 0xAA        | Communication packet header                    |
| 2 <sup>nd</sup>  | Command | 0x9B        | Command executed                               |
| 3 <sup>rd</sup>  | Date    | Year        | Year: 00~99 (00=year 2000) (8bit binary value) |
| 4 <sup>th</sup>  |         | Month       |                                                |
| 5 <sup>th</sup>  |         | Day         |                                                |
| 6 <sup>th</sup>  | Time    | Hour        | Hour 00~23 (24hr format)(8bit binary value)    |
| 7 <sup>th</sup>  |         | Minute      |                                                |
| 8 <sup>th</sup>  |         | Second      |                                                |
| 9 <sup>th</sup>  | Tail    | 0xCC        | Communication packet tail                      |
| 10 <sup>th</sup> |         | 0x33        |                                                |
| 11 <sup>th</sup> |         | 0xC3        |                                                |
| 12 <sup>th</sup> |         | 0x3C        |                                                |

Note.

\*1. The Response code with communication packet format (see Communication Packet Structure Section for details)

**4.2.15 RTC\_set ( 0x9C )**

| seq | Cmd-code / Par-data | Descriptions                                                                                                   |
|-----|---------------------|----------------------------------------------------------------------------------------------------------------|
| 1   | 0x9C                | Set the RTC                                                                                                    |
| 2   | Year                | Year = 00~99(2000 ~ 2099)<br>Month = 00~12<br>Date = 00~31<br>Hour = 00~23<br>Minute = 00~59<br>Second = 00~59 |
| 3   | Month               |                                                                                                                |
| 4   | Date                |                                                                                                                |
| 5   | Hour                |                                                                                                                |
| 6   | Minute              |                                                                                                                |
| 7   | Second              |                                                                                                                |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

**4.2.16 USR\_bin\_read ( 0x93 )**

| seq | Cmd-code / Par-data | Descriptions                                                               |
|-----|---------------------|----------------------------------------------------------------------------|
| 1   | 0x93                | Read USR_bin data from the flash at specified address                      |
| 2   | Address3(MSB)       | the specified start address to write<br>Address range = 0x00000 ~ 0x03FFFF |
| 3   | Address2            |                                                                            |
| 4   | Address1            |                                                                            |
| 5   | Address0(LSB)       |                                                                            |
| 6   | Data_Lengthh        | The no. of data byte to read<br>Length = 0x0001 ~ 0x0400                   |
| 7   | Data_Lengthl        |                                                                            |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

**Response code:**

| Seq.            | Content | Byte in Hex | Descriptions                |
|-----------------|---------|-------------|-----------------------------|
| 1 <sup>st</sup> | Header  | 0xAA        | Communication packet header |
| 2 <sup>nd</sup> | Command | 0x93        | Command executed            |
| 3 <sup>rd</sup> | Data    | data        | Read back data              |
| :               |         | :           |                             |
| :               |         | :           |                             |
| :               |         | :           |                             |
| :               | Tail    | 0xCC        | Communication packet tail   |
| :               |         | 0x33        |                             |
| :               |         | 0xC3        |                             |
| :               |         | 0x3C        |                             |

Note.

\*1. The Response code with communication packet format (see Communication Packet Structure Section for details)

**4.2.17 U\_drv\_format ( 0xE2 )**

| seq | Cmd-code / Par-data | Descriptions                                                   |
|-----|---------------------|----------------------------------------------------------------|
| 1   | 0xE2                | Format the USB drive.                                          |
| 2   | 0x55                | All the files (include the security lock file) will be erased. |
| 3   | 0xAA                |                                                                |
| 4   | 0x5A                |                                                                |
| 5   | 0xA5                |                                                                |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

**4.2.18 U\_drv\_unlock ( 0xE3 )**

| seq | Cmd-code / Par-data | Descriptions                                                             |
|-----|---------------------|--------------------------------------------------------------------------|
| 1   | 0xE3                | Unlock the USB drive of file read/write with pre-stored password.        |
| 2   | PW                  | PW: password in ASCII<br>Length = 127max.<br>'\0'(0x00): string end mark |
| :   | :                   |                                                                          |
| :   | :                   |                                                                          |
| :   | '\0'                |                                                                          |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

### 4.3 Display Control Function Commands Details

#### 4.3.1 disp\_page ( 0x70 )

| seq | Cmd-code / Par-data | Descriptions                        |
|-----|---------------------|-------------------------------------|
| 1   | 0x70                | Display a pre-stored TML file(page) |
| 2   | Page_IDh            | Page_ID = 0~999                     |
| 3   | Page_IDl            |                                     |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

#### 4.3.2 set\_element\_fg ( 0x7E )

| Seq | Cmd-code / Par-data | Descriptions                                      |
|-----|---------------------|---------------------------------------------------|
| 1   | 0x7E                | Set foreground colors of the STR, N16, N32 or N64 |
| 2   | Element             | 0x00 = STR; 0x01 = N16, N32, N64                  |
| 3   | Page_IDh            | Page_ID = 0~999                                   |
| 4   | Page_IDl            |                                                   |
| 5   | Element_ID          | VP_STR = 0~127; N16, N32, N64 = 0~119             |
| 6   | 0x00                | Reserve                                           |
| 7   | FGh                 | Foreground color(0~0xffff)                        |
| 8   | FGl                 |                                                   |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

#### 4.3.3 set\_element\_bg ( 0x7F )

| Seq | Cmd-code / Par-data | Descriptions                                     |
|-----|---------------------|--------------------------------------------------|
| 1   | 0x7F                | Set background color of the STR, N16, N32 or N64 |
| 2   | Element             | 0x00 = STR; 0x01 = N16, N32, N64                 |
| 3   | Page_IDh            | Page_ID = 0~999                                  |
| 4   | Page_IDl            |                                                  |
| 5   | Element_ID          | VP_STR = 0~127, N16, N32, N64 = 0~119            |
| 6   | Mode                | 0x00: non transparent; 0x01 : transparent        |
| 7   | BGh                 | Background color(0 ~ 0xffff)                     |
| 8   | BGl                 |                                                  |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

#### 4.3.4 set\_codepage (0xE7)

| Seq | Cmd-code / Par-data | Descriptions                                           |
|-----|---------------------|--------------------------------------------------------|
| 1   | 0xE7                | Sets country character set and code-page character set |
| 2   | Country             | 1 ~ 11, country character set                          |
| 3   | Codepage            | 1 ~ 22, code-page character set                        |

Note.

\*1. Country and CodePage table

| Country Code | Descriptions   | Code Page | Descriptions                        |
|--------------|----------------|-----------|-------------------------------------|
| 1            | USA            | 1         | 437 (OEM – United States)           |
| 2            | France         | 2         | 737 (OEM – Greek 437G)              |
| 3            | Germany        | 3         | 852 (OEM – Latin II)                |
| 4            | United Kingdom | 4         | 860 (OEM – Portuguese)              |
| 5            | Demark I       | 5         | 863 (OEM – Canadian French)         |
| 6            | Demark II      | 6         | 865 (OEM – Nordic)                  |
| 7            | Sweden         | 7         | 866 (OEM – Russian)                 |
| 8            | Italy          | 8         | 874 (ANSI/OEM – Thai)               |
| 9            | Spain          | 9         | 932 (ANSI/OEM – Japanese Shift-JIS) |
| 10           | Japan          | 10        | 1250 (ANSI - Central Europe)        |
| 11           | Norway         | 11        | 1251 (ANSI – Cyrillic)              |
| --           | --             | 12        | 1252 (ANSI – Latin I)               |
| --           | --             | 13        | 1253 (ANSI – Greek)                 |
| --           | --             | 14        | 1254 (ANSI – Turkish)               |
| --           | --             | 15        | 1255 (ANSI – Hebrew)                |
| --           | --             | 16        | 1256 (ANSI – Arabic)                |
| --           | --             | 17        | 1257 (ANSI – Baltic)                |
| --           | --             | 18        | 1258 (ANSI – Viet Nam)              |
| --           | --             | 19        | GB2312                              |
| --           | --             | 20        | GBK                                 |
| --           | --             | 21        | EUC_KR                              |
| --           | --             | 22        | Big5                                |

#### 4.3.5 suspend\_vp\_refresh (0xE8)

| Seq | Cmd-code / Par-data | Descriptions                                                                                                            |
|-----|---------------------|-------------------------------------------------------------------------------------------------------------------------|
| 1   | 0xE8                | Set the screen to pause the refresh and deactivate the touchkey or release the pause to refresh and enable the touchkey |
| 2   | 55                  |                                                                                                                         |
| 3   | AA                  |                                                                                                                         |
| 4   | 5A                  |                                                                                                                         |
| 5   | A5                  |                                                                                                                         |
| 6   | Mode                | 0x00: release the pause to refresh and enable the touchkey<br>0x01: pause the refresh and deactivate the touchkey       |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

### 4.4 VP Function Commands Details

#### 4.4.1 Successive\_write ( 0x82 )

| Seq | Cmd-code / Par-data | Descriptions                                                                                                    |
|-----|---------------------|-----------------------------------------------------------------------------------------------------------------|
| 1   | 0x82                | Write successive value to VP_N16, VP_N32, VP_N64                                                                |
| 2   | Addr3(MSB)          | VP_N16 Address = 0x080000 ~ 0x08FFFF (should be aligned every 2 byte)                                           |
| 3   | Addr2               |                                                                                                                 |
| 4   | Addr1               | VP_N32 Address = 0x020000 ~ 0x02FFFF (should be aligned every 4 byte)                                           |
| 5   | Addr0(LSB)          |                                                                                                                 |
| 6   | Length              | VP_N64 Address = 0x030000 ~ 0x03FFFF (should be aligned every 8 byte)                                           |
| 7   | Data 1(MSB)         | The number of data to write (Length = 1~255)                                                                    |
| 8   | Data 2              | the value to write<br>No. of byte of Data:<br>VP_N16 = Length *2,<br>VP_N32 = Length *4,<br>VP_N64 = Length *8, |
| 9   | Data 3              |                                                                                                                 |
| :   | :                   |                                                                                                                 |
| :   | Data n(LSB)         |                                                                                                                 |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

#### 4.4.2 Successive\_read ( 0x83 )

| Seq | Cmd-code / Par-data | Descriptions                                                          |
|-----|---------------------|-----------------------------------------------------------------------|
| 1   | 0x83                | Read successive value to VP_N16, VP_N32, VP_N64                       |
| 2   | Addr3(MSB)          | VP_N16 Address = 0x080000 ~ 0x08FFFF (should be aligned every 2 byte) |
| 3   | Addr2               |                                                                       |
| 4   | Addr1               | VP_N32 Address = 0x020000 ~ 0x02FFFF (should be aligned every 4 byte) |
| 5   | Addr0(LSB)          |                                                                       |
| 6   | Length              | VP_N64 Address = 0x030000 ~ 0x03FFFF (should be aligned every 8 byte) |
| 7   | Length              | The number of data to write (Length = 1 ~ 255)                        |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

#### Response code:

| Seq.                | Content | Byte in Hex | Descriptions                                                                                                                 |
|---------------------|---------|-------------|------------------------------------------------------------------------------------------------------------------------------|
| 1 <sup>st</sup>     | Header  | 0xAA        | Communication packet header                                                                                                  |
| 2 <sup>nd</sup>     | Command | 0x83        | Command executed                                                                                                             |
| 3 <sup>rd</sup>     | VP_ADD  | Addr3(MSB)  | VP Address<br>0x080000 ~ 0x08FFFF:VP_N16 Address<br>0x020000 ~ 0x02FFFF:VP_N32 Address<br>0x030000 ~ 0x03FFFF:VP_N64 Address |
| 4 <sup>th</sup>     |         | Addr2       |                                                                                                                              |
| 5 <sup>th</sup>     |         | Addr1       |                                                                                                                              |
| 6 <sup>th</sup>     |         | Addr0(LSB)  |                                                                                                                              |
| 7 <sup>rd</sup>     | Length  | NO.         | No. of data                                                                                                                  |
| 8 <sup>rd</sup>     | Data    | Data n(MSB) | No. of byte of Data:<br>VP_N16 = Length *2,<br>VP_N32 = Length *4,<br>VP_N64 = Length *8,                                    |
| :                   |         | :           |                                                                                                                              |
| :                   |         | :           |                                                                                                                              |
| (n-1) <sup>th</sup> |         | Data1       |                                                                                                                              |
| n <sup>th</sup>     | Tail    | Data0(LSB)  | Communication packet tail                                                                                                    |
| (n+1) <sup>th</sup> |         | 0xCC        |                                                                                                                              |
| (n+2) <sup>th</sup> |         | 0x33        |                                                                                                                              |
| (n+3) <sup>th</sup> |         | 0xC3        |                                                                                                                              |
| (n+4) <sup>th</sup> |         | 0x3C        |                                                                                                                              |

Note.

\*1. The Response code with communication packet format (see Communication Packet Structure Section for details)



#### 4.4.3 BP1\_write ( 0x4B )

| Seq | Cmd-code / Par-data | Descriptions                             |
|-----|---------------------|------------------------------------------|
| 1   | 0x4B                | Write raw bit-map data to the VP_BP1     |
| 2   | Addr3(MSB)          | VP_BP1 Address = 0x040000 ~ 0x05FFFF     |
| 3   | Addr2               |                                          |
| 4   | Addr1               |                                          |
| 5   | Addr0(LSB)          |                                          |
| 6   | Length3(MSB)        | the number of data<br>Length = 1 ~ 98304 |
| 7   | Length2             |                                          |
| 8   | Length1             |                                          |
| 9   | Length0(LSB)        |                                          |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

\*2. After the above command issued, it follow with the raw data byte with out communication packet structure.

\*3. over all command flow

| HOST                                                            | Flow | module                                                                 |
|-----------------------------------------------------------------|------|------------------------------------------------------------------------|
| BP1_write Command<br>(in communication packet structure)        | →    | Instruct to wait for data....                                          |
| Raw 1bpp image data<br>(without communication packet structure) | →    | Store the data into VP_BP1                                             |
|                                                                 | ←    | Response code ">" in ASCII<br>(without communication packet structure) |

#### 4.4.4 BP1\_write\_compress ( 0x4C )

| Seq | Cmd-code / Par-data | Descriptions                                |
|-----|---------------------|---------------------------------------------|
| 1   | 0x4C                | Write compressed bit-map data to the VP_BP1 |
| 2   | Addr3(MSB)          | VP_BP1 Address = 0x040000 ~ 0x05FFFF        |
| 3   | Addr2               |                                             |
| 4   | Addr1               |                                             |
| 5   | Addr0(LSB)          |                                             |
| 6   | Length3(MSB)        | the number of data<br>Length = 1 ~ 98304    |
| 7   | Length2             |                                             |
| 8   | Length1             |                                             |
| 9   | Length0(LSB)        |                                             |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

\*2. After the above command issued, it follow with the compressed data byte with out communication packet structure.

\*3. over all command flow

| HOST                                                                   | Flow | module                                                                 |
|------------------------------------------------------------------------|------|------------------------------------------------------------------------|
| BP1_write Command<br>(in communication packet structure)               | →    | Instruct to wait for data....                                          |
| compressed 1bpp image data<br>(without communication packet structure) | →    | Store the data into VP_BP1                                             |
|                                                                        | ←    | Response code ">" in ASCII<br>(without communication packet structure) |

**4.4.5 G16\_write ( 0x4D )**

| Seq | Cmd-code / Par-data | Descriptions                                       |
|-----|---------------------|----------------------------------------------------|
| 1   | 0x4D                | Write graph values to the VP_G16 array             |
| 2   | Addr1_H             | VP_G16 Address = 0x060000 ~ 0x07FFFF               |
| 3   | Addr1l              |                                                    |
| 4   | Addr2h              |                                                    |
| 5   | Addr2l              |                                                    |
| 6   | Sizeh               |                                                    |
| 7   | Sizel               | Array-size = 1 ~ 1024<br>(*2, *3)                  |
| 8   | Data(MSB)           | 16 bit data array<br>(no. of byte = 2x array-size) |
| 9   | Data(LSB)           |                                                    |
| 10  | Data(MSB)           |                                                    |
| 11  | Data(LSB)           |                                                    |
| :   | :                   |                                                    |
| :   | :                   |                                                    |
| :   | :                   |                                                    |
| :   | :                   |                                                    |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

\*2. Array-size = no. of 16bit values

\*3. Array-size suggest to be same at the size value defined in TML editor

**4.4.6 G16\_write\_rotate ( 0x4E )**

| Seq | Cmd-code / Par-data | Descriptions                                                                 |
|-----|---------------------|------------------------------------------------------------------------------|
| 1   | 0x4E                | Write graph values to the last position of VP_G16 array with rotation effect |
| 2   | Addr1_H             | VP_G16 Address = 0x060000 ~ 0x07FFFF                                         |
| 3   | Addr1_L             |                                                                              |
| 4   | Addr2_H             |                                                                              |
| 5   | Addr2_L             |                                                                              |
| 6   | Size_H              |                                                                              |
| 7   | Size_L              | Array-size to be rotate = 1 ~ 65535<br>(*2, *3)                              |
| 8   | Data(MSB)           | 16 bit data value to be add to the end-of-array                              |
| 9   | Data(LSB)           |                                                                              |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

\*2. Array-size = no. of 16bit values

\*3. Array-size suggest to be same at the value defined in TML editor

**4.4.7 System Register Write ( 0x3B )**

| seq | Cmd-code / Par-data | Descriptions                   |
|-----|---------------------|--------------------------------|
| 1   | 0x3B                | System Register Write Command  |
| 2   | Addr3(MSB)          | Timer_Ctrl0 Address = 0xFFFF00 |
| 3   | Addr2               |                                |
| 4   | Addr1               |                                |
| 5   | Addr0(LSB)          | Timer_Ctrl7 Address = 0xFFFF07 |
| 6   | Data                | the value to write             |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

#### 4.4.8 System Register Read ( 0x3C )

| seq | Cmd-code / Par-data | Descriptions                                 |
|-----|---------------------|----------------------------------------------|
| 1   | 0x3C                | System Register Read Command                 |
| 2   | Addr3(MSB)          | Address = 0xFFFF00<br>:<br>Address = 0xFFFFF |
| 3   | Addr2               |                                              |
| 4   | Addr1               |                                              |
| 5   | Addr0(LSB)          |                                              |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

#### Response code:

| Seq.             | Content | Byte in Hex | Descriptions                                 |
|------------------|---------|-------------|----------------------------------------------|
| 1 <sup>st</sup>  | Header  | 0xAA        | Communication packet header                  |
| 2 <sup>nd</sup>  | Command | 0x3C        | Command executed                             |
| 3 <sup>rd</sup>  | Address | Addr3(MSB)  | Address = 0xFFFF00<br>:<br>Address = 0xFFFFF |
| 4 <sup>th</sup>  |         | Addr2       |                                              |
| 5 <sup>th</sup>  |         | Addr1       |                                              |
| 6 <sup>th</sup>  |         | Addr0(LSB)  |                                              |
| 7 <sup>th</sup>  | Data    | Data(1Byte) | the value of the register                    |
| 8 <sup>th</sup>  | Tail    | 0xCC        | Communication packet tail                    |
| 9 <sup>th</sup>  |         | 0x33        |                                              |
| 10 <sup>th</sup> |         | 0xC3        |                                              |
| 11 <sup>th</sup> |         | 0x3C        |                                              |

Note.

\*1. The Response code with communication packet format (see Communication Packet Structure Section for details)

\*2. When Timer reach the 0x00000000 or 0x7FFFFFFF, a notification will be provided a 0x77 response code with the corresponding Timer Address and Value.(See touch\_response(0x77)for details)

#### 4.4.9 STR\_write ( 0x42 )

| Seq | Cmd-code / Par-data | Descriptions                                                                                                     |
|-----|---------------------|------------------------------------------------------------------------------------------------------------------|
| 1   | 0x42                | Write string to VP_STR                                                                                           |
| 2   | Addr3(MSB)          | the VP_STR Address = 0x00000 ~ 0x01FFFF<br>(each VP_STR = 128 bytes)<br>(address value must be divisible by 128) |
| 3   | Addr2               |                                                                                                                  |
| 4   | Addr1               |                                                                                                                  |
| 5   | Addr0(LSB)          |                                                                                                                  |
| 6   | data                | String to write                                                                                                  |
| :   | :                   | Total no. of byte in string ≤128                                                                                 |
| :   | :                   |                                                                                                                  |
| :   | '\0'                | '\0'(0x00): string end mark                                                                                      |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

#### 4.4.10 STR\_read ( 0x43 )

| Seq | Cmd-code / Par-data | Descriptions                                                                                                     |
|-----|---------------------|------------------------------------------------------------------------------------------------------------------|
| 1   | 0x43                | Read string from VP_STR                                                                                          |
| 2   | Addr3(MSB)          | the VP_STR Address = 0x00000 ~ 0x01FFFF<br>(each VP_STR = 128 bytes)<br>(address value must be divisible by 128) |
| 3   | Addr2               |                                                                                                                  |
| 4   | Addr1               |                                                                                                                  |
| 5   | Addr0(LSB)          |                                                                                                                  |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

#### Response code:

| Seq.            | Content     | Byte in Hex | Descriptions                |
|-----------------|-------------|-------------|-----------------------------|
| 1 <sup>st</sup> | Header      | 0xAA        | Communication packet header |
| 2 <sup>nd</sup> | Command     | 0x43        | Command executed            |
| 3 <sup>rd</sup> | String data | data        | String code                 |
| :               |             | :           |                             |
| :               |             | :           |                             |
| :               |             | :           |                             |
| :               | \0          | 0x00        | '\0'(0x00): string end mark |
| :               | Tail        | 0xCC        | Communication packet tail   |
| :               |             | 0x33        |                             |
| :               |             | 0xC3        |                             |
| :               |             | 0x3C        |                             |

Note.

\*1. The Response code with communication packet format (see Communication Packet Structure Section for details)

## 4.4.11 STR\_fill ( 0x46 )

| Seq | Cmd-code / Par-data | Descriptions                                                                                                     |
|-----|---------------------|------------------------------------------------------------------------------------------------------------------|
| 1   | 0x46                | Write string to VP_STR                                                                                           |
| 2   | Addr3(MSB)          | the VP_STR Address = 0x00000 ~ 0x01FFFF<br>(each VP_STR = 128 bytes)<br>(address value must be divisible by 128) |
| 3   | Addr2               |                                                                                                                  |
| 4   | Addr1               |                                                                                                                  |
| 5   | Addr0(LSB)          |                                                                                                                  |
| 6   | Lengthh             | the number of VP_STR (including the start address) to be filled<br>Length = 1 ~ 1024                             |
| 7   | Lengthl             |                                                                                                                  |
| 8   | data                | String to write                                                                                                  |
| :   | :                   | Total no. of byte in string ≤128                                                                                 |
| :   | :                   |                                                                                                                  |
| :   | '\0'                | '\0'(0x00): string end mark                                                                                      |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

## 4.4.12 N16\_write ( 0x3D )

| Seq | Cmd-code / Par-data | Descriptions                                                                                             |
|-----|---------------------|----------------------------------------------------------------------------------------------------------|
| 1   | 0x3D                | Write 16bit number to VP_N16                                                                             |
| 2   | Addr3(MSB)          | VP_N16 Address = 0x080000 ~ 0x08FFFF<br>(each VP_N16 = 2 byte)<br>(address value must be divisible by 2) |
| 3   | Addr2               |                                                                                                          |
| 4   | Addr1               |                                                                                                          |
| 5   | Addr0(LSB)          |                                                                                                          |
| 6   | High Byte           | The 16 bit value to write                                                                                |
| 7   | Low Byte            |                                                                                                          |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

## 4.4.13 N16\_read ( 0x3E )

| Seq | Cmd-code / Par-data | Descriptions                                                                                             |
|-----|---------------------|----------------------------------------------------------------------------------------------------------|
| 1   | 0x3E                | Read 16bit number from VP_N16                                                                            |
| 2   | Addr3(MSB)          | VP_N16 Address = 0x080000 ~ 0x08FFFF<br>(each VP_N16 = 2 byte)<br>(address value must be divisible by 2) |
| 3   | Addr2               |                                                                                                          |
| 4   | Addr1               |                                                                                                          |
| 5   | Addr0(LSB)          |                                                                                                          |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

## Response code:

| Seq.            | Content   | Byte in Hex | Descriptions                |
|-----------------|-----------|-------------|-----------------------------|
| 1 <sup>st</sup> | Header    | 0xAA        | Communication packet header |
| 2 <sup>nd</sup> | Command   | 0x3E        | Command executed            |
| 3 <sup>rd</sup> | N16 value | Data1(MSB)  | 16 bit value                |
| 4 <sup>th</sup> |           | Data0(LSB)  |                             |
| 5 <sup>th</sup> | Tail      | 0xCC        | Communication packet tail   |
| 6 <sup>th</sup> |           | 0x33        |                             |
| 7 <sup>th</sup> |           | 0xC3        |                             |
| 8 <sup>th</sup> |           | 0x3C        |                             |

Note.

\*1. The Response code with communication packet format (see Communication Packet Structure Section for details)

## 4.4.14 N16\_fill ( 0x3F )

| Seq | Cmd-code / Par-data | Descriptions                                                                                             |
|-----|---------------------|----------------------------------------------------------------------------------------------------------|
| 1   | 0x3F                | Fill 16bit number to the VP_N16                                                                          |
| 2   | Addr3(MSB)          | VP_N16 Address = 0x080000 ~ 0x08FFFF<br>(each VP_N16 = 2 byte)<br>(address value must be divisible by 2) |
| 3   | Addr2               |                                                                                                          |
| 4   | Addr1               |                                                                                                          |
| 5   | Addr0(LSB)          |                                                                                                          |
| 6   | Lengthh             | the number of VP_N16 (including the start address) to be filled<br>Length = 1 ~ 32768                    |
| 7   | Lengthl             |                                                                                                          |
| 8   | High Byte           | the 16 bit value to fill                                                                                 |
| 9   | Low Byte            |                                                                                                          |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

## 4.4.15 N32\_write ( 0x44 )

| Seq | Cmd-code / Par-data | Descriptions                                                                                             |
|-----|---------------------|----------------------------------------------------------------------------------------------------------|
| 1   | 0x44                | Write 32bit number to VP_N32                                                                             |
| 2   | Addr3(MSB)          | VP_N32 Address = 0x020000 ~ 0x02FFFF<br>(each VP_N32 = 4 byte)<br>(address value must be divisible by 4) |
| 3   | Addr2               |                                                                                                          |
| 4   | Addr1               |                                                                                                          |
| 5   | Addr0(LSB)          |                                                                                                          |
| 6   | Data3(MSB)          | the 32 bit no. value write.                                                                              |
| 7   | Data2               |                                                                                                          |
| 8   | Data1               |                                                                                                          |
| 9   | Data0(LSB)          |                                                                                                          |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

## 4.4.16 N32\_read ( 0x45 )

| Seq | Cmd-code / Par-data | Descriptions                                                                                             |
|-----|---------------------|----------------------------------------------------------------------------------------------------------|
| 1   | 0x45                | Read 32bit number from VP_N32                                                                            |
| 2   | Addr3(MSB)          | VP_N32 Address = 0x020000 ~ 0x02FFFF<br>(each VP_N32 = 4 byte)<br>(address value must be divisible by 4) |
| 3   | Addr2               |                                                                                                          |
| 4   | Addr1               |                                                                                                          |
| 5   | Addr0(LSB)          |                                                                                                          |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

## Response code:

| Seq.             | Content   | Byte in Hex | Descriptions                |
|------------------|-----------|-------------|-----------------------------|
| 1 <sup>st</sup>  | Header    | 0xAA        | Communication packet header |
| 2 <sup>nd</sup>  | Command   | 0x45        | Command executed            |
| 3 <sup>rd</sup>  | N32 value | Data3(MSB)  | 32 bit value                |
| 4 <sup>th</sup>  |           | Data2       |                             |
| 5 <sup>th</sup>  |           | Data1       |                             |
| 6 <sup>th</sup>  |           | Data0(LSB)  |                             |
| 7 <sup>th</sup>  | Tail      | 0xCC        | Communication packet tail   |
| 8 <sup>th</sup>  |           | 0x33        |                             |
| 9 <sup>th</sup>  |           | 0xC3        |                             |
| 10 <sup>th</sup> |           | 0x3C        |                             |

Note.

\*1. The Response code with communication packet format (see Communication Packet Structure Section for details)

## 4.4.17 N32\_fill ( 0x47 )

| Seq | Cmd-code / Par-data | Descriptions                                                                                             |
|-----|---------------------|----------------------------------------------------------------------------------------------------------|
| 1   | 0x47                | Fill 32bit number to the VP_N32                                                                          |
| 2   | Addr3(MSB)          | VP_N32 Address = 0x020000 ~ 0x02FFFF<br>(each VP_N32 = 4 byte)<br>(address value must be divisible by 4) |
| 3   | Addr2               |                                                                                                          |
| 4   | Addr1               |                                                                                                          |
| 5   | Addr0(LSB)          |                                                                                                          |
| 6   | Lengthh             | the number of VP_N32 (including the start address) to be filled<br>Length = 1 ~ 16384                    |
| 7   | Lengthl             |                                                                                                          |
| 8   | Data3(MSB)          | the 32 bit no. value to fill                                                                             |
| 9   | Data2               |                                                                                                          |
| 10  | Data1               |                                                                                                          |
| 11  | Data0(LSB)          |                                                                                                          |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

**4.4.18 N64\_write ( 0x48 )**

| Seq | Cmd-code / Par-data | Descriptions                                                                                            |
|-----|---------------------|---------------------------------------------------------------------------------------------------------|
| 1   | 0x48                | Write 64bit number to VP_N64                                                                            |
| 2   | Addr3(MSB)          | VP_N64 Address= 0x030000 ~ 0x03FFFF<br>(each VP_N64 = 8 byte)<br>(address value must be divisible by 8) |
| 3   | Addr2               |                                                                                                         |
| 4   | Addr1               |                                                                                                         |
| 5   | Addr0(LSB)          | the 64bit no. value write.                                                                              |
| 6   | Data7(MSB)          |                                                                                                         |
| 7   | Data6               |                                                                                                         |
| :   | :                   |                                                                                                         |
| :   | :                   |                                                                                                         |
| 12  | Data1               |                                                                                                         |
| 13  | Data0(LSB)          |                                                                                                         |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

**4.4.19 N64\_read ( 0x49 )**

| Seq | Cmd-code / Par-data | Descriptions                                                                                            |
|-----|---------------------|---------------------------------------------------------------------------------------------------------|
| 1   | 0x49                | Read 64bit number from VP_N64                                                                           |
| 2   | Addr3(MSB)          | VP_N64 Address= 0x030000 ~ 0x03FFFF<br>(each VP_N64 = 8 byte)<br>(address value must be divisible by 8) |
| 3   | Addr2               |                                                                                                         |
| 4   | Addr1               |                                                                                                         |
| 5   | Addr0(LSB)          |                                                                                                         |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

**Response code:**

| Seq.             | Content   | Byte in Hex | Descriptions                |
|------------------|-----------|-------------|-----------------------------|
| 1 <sup>st</sup>  | Header    | 0xAA        | Communication packet header |
| 2 <sup>nd</sup>  | Command   | 0x49        | Command executed            |
| 3 <sup>rd</sup>  | N64 value | Data7(MSB)  | 64 bit value                |
| 4 <sup>th</sup>  |           | Data6       |                             |
| :                |           | :           |                             |
| :                |           | :           |                             |
| 9 <sup>th</sup>  |           | Data1       |                             |
| 10 <sup>th</sup> |           | Data0(LSB)  |                             |
| 11 <sup>th</sup> | Tail      | 0xCC        | Communication packet tail   |
| 12 <sup>th</sup> |           | 0x33        |                             |
| 13 <sup>th</sup> |           | 0xC3        |                             |
| 14 <sup>th</sup> |           | 0x3C        |                             |

Note.

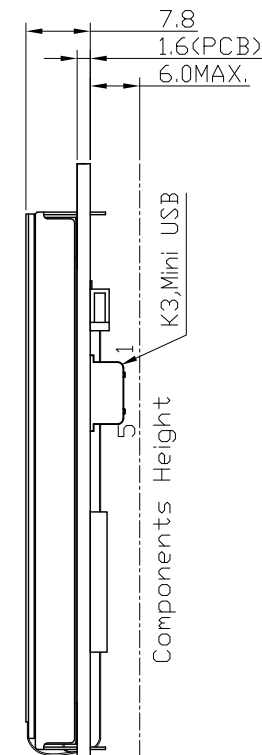
\*1. The Response code with communication packet format (see Communication Packet Structure Section for details)

**4.4.20 N64\_fill ( 0x4A )**

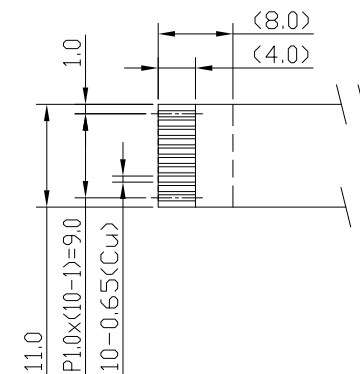
| Seq | Cmd-code / Par-data | Descriptions                                                                                            |
|-----|---------------------|---------------------------------------------------------------------------------------------------------|
| 1   | 0x4A                | Fill 64bit number to the VP_N64                                                                         |
| 2   | Addr3(MSB)          | VP_N64 Address= 0x030000 ~ 0x03FFFF<br>(each VP_N64 = 8 byte)<br>(address value must be divisible by 8) |
| 3   | Addr2               |                                                                                                         |
| 4   | Addr1               |                                                                                                         |
| 5   | Addr0(LSB)          | the number of VP_N64 (including the start address) to be filled<br>Length = 1 ~ 8192                    |
| 6   | Lengthh             |                                                                                                         |
| 7   | Lengthl             |                                                                                                         |
| 8   | Data7(MSB)          |                                                                                                         |
| 9   | Data6               |                                                                                                         |
| :   | :                   |                                                                                                         |
| :   | :                   |                                                                                                         |
| 14  | Data1               |                                                                                                         |
| 15  | Data0(LSB)          |                                                                                                         |

Note.

\*1. Command should be transferred in communication packet structure (see Communication Packet Structure Section for details)

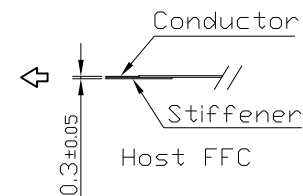


| K1&K2 Terminal |           |
|----------------|-----------|
| No             | Pin Name  |
| 1              | VDD       |
| 2              | VDD       |
| 3              | VDD       |
| 4              | NC        |
| 5              | RX        |
| 6              | TX        |
| 7              | RTS(BUSY) |
| 8              | GND       |
| 9              | GND       |
| 10             | GND       |



Host FFC Details  
Scale=3/2

- \*1. LCD Display Type : TFT , Transmissive
- \*2. Pixel Arrangement : RGB-STRIPE
- \*3. Color Depth : 65k Colors
- \*4. Operating Voltage : 5.0V
- \*5. Backlight : White LED
- \*6. K1/K2 Interface : RS-232C
- \*7. Terminal:
  - K1: 10Pin P1.0 FFC Socket Or Equivalent
  - K3: Mini USB
- \*8. Touch Panel Type : Resistive Touch Panel
- \*9. Operating Temperature : -20°C~70°C
- \*10. Storage Temperature : -30°C~80°C
- \*11. Foam Gasket must be assemble outside TP VA by 0.5mm



|                          |           |               |               |                                                                                       |
|--------------------------|-----------|---------------|---------------|---------------------------------------------------------------------------------------|
| C                        |           |               |               |                                                                                       |
| B                        |           |               |               |                                                                                       |
| A                        |           |               |               |                                                                                       |
| Rev Note                 |           |               |               | Date                                                                                  |
| Dwg Title                |           |               |               |                                                                                       |
| HMT035ATA-1C Outline Dwg |           |               |               |                                                                                       |
| Dwg No.                  |           | MK-006293-1-1 |               | Date                                                                                  |
| Scale                    |           | Unit          |               | 2018-03-01                                                                            |
| 3/2                      | Tol. ±0.5 | mm            | Paper Size A3 |  |
| Approved                 |           | Checked       |               | Drawn                                                                                 |
|                          |           |               |               | Weianguangyan                                                                         |
| <b>TOPWAY</b>            |           |               |               |                                                                                       |